Design and development of a μPAD device for magnesium determination in saliva

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Magnesium is the second most important intracellular cation and the fourth most prevalent. Disorders involving magnesium are categorized into two groups: hypomagnesemia (magnesium deficiency) and hypermagnesemia. Therefore, the determination of magnesium can be of great interest, because it helps in the clinical context and epidemiological research.

In this context, the objective of propose work was to develop a microfluidic paper-based analytical device (μPAD) for magnesium quantification in saliva. There are two main advantages on using saliva as an alternative biological sample namely being easy to collect and non-invasive. The μPADs have several characteristics which make them ideally suited to conduct on-location analyte determinations: there is no need for specialized skills or expensive equipment; all materials are cheap and easily obtained; the overall size is ideally for on-hand determination; and they can be discarded after use in a disposable approach. Another advantage of these devices is that they use small amounts of sample and reagent, still providing both immediate and accurate results.

The developed μPAD was based on the color reaction between magnesium and eriochrome cyanine dye. The μPAD was assembled with the reagent, and then the sample was added, followed by the sealing of the device. After 5 min (for the reaction to occur) a scanner was used to obtain a high resolution image of the detection zone and then the colour intensity was measured (Image J software) to established calibration curves.

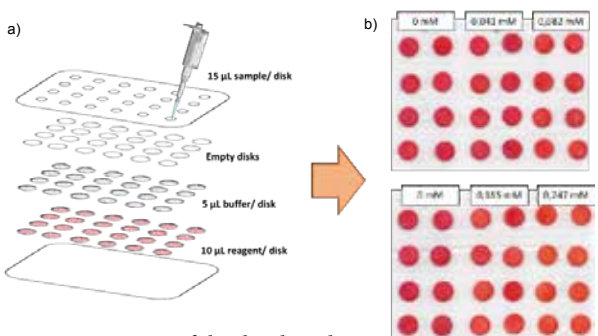

Fig.1. Schematic representation of the developed μPAD (a) and photo of the two μPADs representing a calibration curve (b)

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